U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Change 9 to STANDARDS FOR SPECIFYING CONSTRUCTION OF AIRPORTS

Date: 9/10/96
Initiated by: AAS-200

AC No: 150/5370-10A
Change: 9

1. PURPOSE. ITEM P-620, RUNWAY AND TAXIWAY PAINTING, has been revised to specify waterborne, epoxy, methacrylate, and solvent based paints. Glass beads and silica sand have been given additional emphasis to increase conspicuity and friction characteristics of markings.

2. PRINCIPLE CHANGES.

1. Paragraph 620-2.1 MATERIALS ACCEPTANCE has been added to allow certified test reports for materials.

2. Paragraph 620-2.2 PAINT has been revised to add material and test requirements for waterborne, epoxy, and methacrylate based paints. Specifications **for** solvent **based paints,** which were omitted from the draft in anticipation of Environmental Protection Agency (EPA) regulations regarding volatile organic content (VOC), have been reinstated and are referenced by Federal specifications maintained by the General Services Administration. Inclusion of solvent based paints will be reconsidered if EPA promulgates regulations on VOC levels.

3. Paragraph 2.3 REFLECTIVE MEDIA has been added to allow the use of Type I--Gradation A or Type III glass beads.

4, Paragraph 620-2.4 SILICA SAND has been added to allow the optional use of silica sand to improve friction properties of markings.

5. CONSTRUCTION METHODS has been modified to incorporate equipment and application rates for paint, glass beads, and sand.

6. METHOD OF MEASUREMENT AND BASIS OF PAYMENT have been revised to incorporate glass beads and sand as pay items.

The change number and date are shown at the top of each page.

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DAVID L. BENNETT
Director, Office of Airport Safety and Standards

ITEM P-620 RUNWAY AND TAXIWAY PAINTING

DESCRIPTION

620-1.1 This item shall consist of the painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site.

620-2.2 PAINT. Paint **shall** be **waterborne, Epoxy, Methacrylate, or Solvent base]** in accordance with the requirements of paragraph **620-2.2[ ].** Paint shall be furnished in [**]** in accordance with Federal Standard No 595. Paint shall be furnished in **[Type I -- Standard drying time for no-pick-up] [Type II -- Fast drying time for no-pick-up]** when tested in accordance with ASTM D 7 11.

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The Engineer shall specify paint type(s) and appropriate paragraph number(s).

The Engineer shall insert the colors to be used on a project from the following list:

White - 37925 **Red - 31136**
Yellow - 33538 or 33655 **Black - 37038**
Pink - 2 parts Red - 31136 to 1 part White - 37925

Waterborne or solvent base black paint can be used to outline a border at least 6 inches (150 mm) wide around markings on light colored pavements.

Type I is intended for those locations where slower tracking is not an inconvenience.
Type II is intended for striping locations where faster curing is desirable.

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a. WATERBORNE. Paint shall meet the requirements of Federal Specification m-P-1952.

b. EPOXY. Paint shall be a two component, minimum 99 percent solids type system conforming to the following:

(1) Pigments. Component A. Percent by weight.

(a) **White:**
Titanium Dioxide, ASTM D 476, type II shall be 18 percent minimum (16.5 percent minimum at 100 percent purity).

(b) Yellow and Colors:
Titanium Dioxide, ASTM D 476, type II shall be 14 to 17 percent.
Organic yellow, other colors, and tinting as required to meet color standard.
Epoxy resin shall be 75 to 79 percent.

(a) White:

Titanium Dioxide, ASTM D 476, type II shall be 6 percent minimum.
Methacrylate resin shall be 18 percent minimum.

(b) Yellow and Colors:

Titanium Dioxide, ASTM D 476, type II shall be 6 percent minimum.
Organic yellow, other colors, and tinting as required to meet color standard.
Methacrylate resin shall be 18 percent minimum,.

(2) Prohibited Materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogen&d solvents, nor any carcinogen, as defined in 29 CFR 1910.1200.

(3) Daylight Directional Reflectance:

(a) White: The daylight directional reflectance of the white paint shall not be less than 80 percent (relative to magnesium oxide), when tested in accordance with Federal Test Method Standard No. 141, Method 6121.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55 percent (relative to magnesium oxide), when tested in accordance with Federal Test Method Standard No. 141. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(4) **Accelerated weathering.**

(a) Sample preparation. Apply the paint at a wet film thickness of 0.013 inch (0.33 mm) to four 3 by 6 inch (8 by 15 cm) aluminum panels prepared as described in Method 2013 of Federal Test Method Standard No. 141. Air dry the sample 48 hours under standard conditions.

(b) Testing conditions. Test in accordance with ASTM G 53 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating 4 hour UV exposure at 60 degree C, and 4 hours condensate exposure at 40 degrees C.

(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine- the directional reflectance and color match using the procedures in paragraph 620-2.2c(3) above. Evaluate for conformance with the color requirements.

(5) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(6) Dry opacity. Use Procedure B, Method B of Method 4121 of Federal Test Method Standard No. 141. The wet film thickness shall be 0.015 inch (0.12 mm). The minimum opacity for white and colors shall be 0.92,

(7) Abrasion resistance. Subject the panels prepared in paragraph 620-2.2c(4) to the abrasion test in accordance with ASTM D 968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch (18.97 to 19.05 mm). Five liters of unused sand shall be used for each test panel. The teat shall be run on two test panels. [Note: five liters of sand weighs 17.5 lb. (7.94 kg).] Both baked and weathered paint films shall require not less than 150 liters of sand for the removal of the paint films.

(8) Hardness, Shore. Hardness shall be at least 80 when tested in accordance with ASTM D 2240.

d. SOLVENT BASE. Paint shall meet the requirements of Federal Specification **[TT-P-85, or TT-P-1101.**

6203.5 APPLICATION. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface have been approved by the Engineer.

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate(s) shown in Table 1. The addition of thinner will not be permitted. A period of [ ] shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

TABLE 1. APPLICATION RATES FOR PAINT, GLASS BEADS, AND SILICA SAND

Paint Type	Paint Square feet per gallon, ft^2/gal (Square meters per liter, m^2/l)	Glass Beads, Type I, Gradation A -- Pounds per gallon of paint--lb./gal. (Kilograms per liter of paint--kg/l)	Glass Beads, Type III Pounds per gallon of paint--lb./gal. (Kilograms per liter of paint--kg/l	Silica Sand Pounds per gallon of paint--lb./gal. (Kilograms per liter of paint--kg/l
*	*	*	*	*

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The Engineer should select the application rates for paint, glass beads, and silica sand from the following table.

APPLICATION RATES FOR PAINT, GLASS BEADS, AND SILICA SAND FOR TABLE 1

Paint Type	Paint Square feet per gallon, ft^2/gal (Square meters per liter, m^2/l)	Glass Beads, Type I, Gradation A Pounds per gallon of paint--lb./gal. (Kilograms per liter of paint-kg/l)	Glass Beads, Type III Pounds per gallon of paint--lb./gal. (Kilograms per liter of paint--kg/l	Silica Sand Pounds per gallon of paint--lb./gal. (Kilograms per liter of paint--kg/l
Waterborne	115 $ft^2/gal.$ maximum (2.8 m^2/l)	7 lb./gal. minimum (0.85 kg/l)	12 lb./gal. minimum (1.45 kg/l)	4 lb./gal. minimum (0.5 kg/l)
Solvent Base	115 $ft^2/gal.$ maximum (2.8 m^2/l)	7 lb./gal. minimum (0.85 kg/l)	12 lb./gal. minimum (1.45 kg/l)	4 lb./gal. minimum (0.5 kg/l)
Epoxy	90 $ft^2/gal.$ maximum (2.2 m^2/l)	15 lb./gal. minimum (1.8 kg/l)	24 lb./gal. minimum (2.9 kg/l)	8 lb./gal. minimum (1.0 kg/l)
Methacrylate	45 $ft^2/gal.$ maximum (1.1 m^2/l)	15 lb./gal. minimum (1.8 kg/l)	24 lb./gal. minimum (2.9 kg/l)	8 lb./gal. minimum (1.0 kg/l)

The Engineer shall specify the time period in order to allow adequate curing of the pavement surface. The Engineer should contact the paint manufacturer to determine the wait period.

Due to the increased surface area to cover, the following should be substituted when painting P-402 Porous Friction Course with waterborne or solvent based paints: "The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine from two directions at 75 percent of the rate(s) shown in Table 1 from each direction."

TESTING REQUIREMENTS

ASTM C-146	Chemical Analysis of Glass Sand
ASTM C 371	Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D 92	Test Method for Flash and Fire Points by Cleveland Open Cup
ASTM D 711	No-Pick-Up Time of Traffic Paint
ASTM D 968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1652	Test Method for Epoxy Content of Epoxy Resins
ASTM D 2074	Test Method for Total Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D 2240	Test Method for Rubber Products-Durometer Hardness
ASTM G 53	Operating Light and Water-Exposure Apparatus (Florescent UV-Condensation Type) for Exposure of Nonmetallic Materials.
Federal Test Method Standard No. 141	Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing

MATERIAL REQUIREMENTS

ASTM D 476	Specifications for Titanium Dioxide Pigments
Code of Federal Regulations	40 CFR Part 60, Appendix A 29 CFR Part 1910.1200
Fed. Spec. 'IT-B-1325	Beads (Glass Spheres) Retroreflective
Fed. Spec. 'IT-P-85	Paint, traffic and Airfield Marking, Solvent Base
Fed. Spec. 'IT-P-110	Paint, Traffic Black (Nonreflectorized)
Fed. Spec. IT-P-1952	Paint, traffic and Airfield Marking, Waterborne
Federal Standard 595	Colors used in Government Procurement

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